

SE 99/01259

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The application was originally filed in English.

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(21) Patentansökningsnummer 9802553-9
Patent application number

(86) Ingivningsdatum 1998-07-15
Date of filing

Stockholm, 1999-08-20

För Patent- och registreringsverket
For the Patent- and Registration Office

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MEDICAL DEVICE

The present invention relates to a medical device, specifically a mounting apparatus for a surgical instrument for ligating internal tissues of a cavity in the human body by means of an elastic cord or band, for example a rubber band.

This invention is particularly, although not exclusively, concerned with ligating haemorrhoids.

This instrument includes an inner front-cylinder with the elastic cord stretched around its front end, and an outer discharge cylinder displaceably arranged on the front cylinder to push the elastic cord along and beyond the front cylinder to close around the stem of the tissue when it is inserted in the front cylinder. This surgical instrument will be referred to herein as a surgical instrument of the type defined.

A surgical instrument of the type defined is disclosed in European patent EP 0310582 B1, the contents of which are incorporated herein by reference.

In its normal "rest" condition the generally circular elastic cord is of considerably smaller diameter than the external diameter of the inner front cylinder. The elastic cord is mounted on the front cylinder by means of a conical adaptor of circular cross-section having a larger rear end which makes a push fit in the inner front cylinder. The adaptor is tapered forwardly to its pointed front end which fits into the elastic cord when in its rest condition. This cord is then pushed or rolled by hand along the adaptor and on to the inner front cylinder by the user, usually the surgeon. Difficulties arise because the elastic cord is small, and the user has to wear gloves as protection against infection. This is increasingly the case when it is required to perform several consecutive ligations.

It is an aim of the invention to alleviate the above-mentioned difficulty, and according to one aspect of the invention there is provided a mounting apparatus for mounting an elastic cord on the front cylinder of a surgical instrument of the type defined; said apparatus

comprising a tapered adaptor having a rear larger end for attachment to the forward end of the front cylinder, and a forward smaller end dimensioned for location in the elastic cord, and a hook device to propel the cord along the adaptor and on to the inner front cylinder, in which the hook device comprises two opposed hooks dimensioned to enter and hook onto the cord when in its rest condition, and in which the device is adapted to bring the hooks towards and away from one another.

The hooks may be located at the ends of opposed arms, and in one embodiment of the invention these arms may be made of a resilient material such as metal wire, preferably spring metal wire.

In another embodiment of the invention the device may be made of a plastics material such as polypropylene. The device may be foldable along a first crease to enable the hooks to be brought close together to enter the cord and to be moved apart to expand the cord, and be foldable along a second crease to enable the adaptor to be moved into position adjacent the hooks.

According to another aspect of the invention there is provided a surgical instrument of the type defined including the above-mentioned mounting apparatus.

According to a further aspect of the invention there is provided a surgical kit comprising the above-mentioned mounting apparatus.

According to another aspect of the invention there is provided a hook device for use in the above-mentioned mounting apparatus.

According to a yet further aspect of the invention there is provided the use of a hook device for mounting an elastic cord on the front cylinder of a surgical instrument of the type defined.

According to yet another aspect of the invention there is provided a method of mounting an

elastic cord on the front cylinder of a surgical instrument of the type defined, said method comprising attaching a tapered adaptor to the forward end of the front cylinder, providing a hook device comprising two opposed hooks to hook onto the elastic cord when in its rest condition, pulling the hook device rearwardly with respect to the surgical instrument to pull the elastic cord over the tapered adaptor onto the front cylinder, and removing the hook device.

The present invention reduces the problems previously encountered when the surgeon had to manipulate the elastic cord by hand when wearing surgical gloves which may become coated with body fluids.

Two embodiments of a mounting apparatus of the invention will now be described by way of example with reference to the accompanying illustrated drawings in which:-

Figure 1 is a side elevation, partly in section, of a surgical instrument of the type defined in a first position,

Figure 2 is side elevation of the instrument of Figure 1 in an actuated position,

Figure 3 is an enlarged sectional view along the line III-III in Figure 1,

Figure 4 is an enlarged sectional view along the line IV-IV in Figure 1,

Figure 5 is a side elevation of an adaptor for the surgical instrument of Figures 1 to 4,

Figure 6 is a side elevation of a first hook device of the invention,

Figure 7 is a side elevation of a second hook device of the invention,

Figure 8 is a perspective view of the second hook device when folded along its first crease, and

Figure 9 is a perspective view of the second hook device when folded along its second crease.

5 Referring to Figures 1 to 4, a surgical instrument for the ligation of haemorrhoids is illustrated in its rest position in Figure 1. The instrument includes an angled profiled tube (4) which is connected at its front end to an inner front-cylinder (1) having an inner volume dimensioned to receive a located haemorrhoid. An elastic cord (2) is located around the front part of the cylinder (1) in its stretched condition.

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The angled tube (4) is divided longitudinally by a partition wall (9) into two separate parts (7) and (8) as shown in Figures 3 and 4.

The part (7) of the tube is adapted to be connected to a vacuum source at its rear end. A
15 restriction hole (10) is situated in the upper side of the tube in a position that is convenient to reach by the operator's finger, or preferably the thumb, when the operator's hand grips the rear angled part of the tube while handling the instrument. The size of the hole (10) is defined by the fact that it shall be capable of being covered by the finger or thumb. Two longitudinally spaced guiding holes (11) are positioned in the lower side of the rear angled
20 part of the tube (4).

An outer discharge cylinder (3) is displaceably mounted on the front cylinder (1). Figure 1 shows this discharge cylinder (3) in its rearward rest position relative to the front cylinder (1). The discharge cylinder (3) is connected to one end of a strip (5) which is arranged to
25 run in the part (8) of the tube from the discharge cylinder (3), out of the forward guiding hole (11) and back into the tube through the rear guiding hole (11) and is then connected to the rear part of the tube. The part of the strip (5) outside the tube between the two guiding holes (11) forms an actuating loop (6).

30 In operation, the rear end of the part (7) of the tube is connected to a vacuum source and the forward part of the tube is inserted into the anal cavity of the patient's body. The

restriction hole (10) is covered by the operator's thumb to create a vacuum in the front cylinder (1) whereby a located haemorrhoid can be sucked into this front cylinder (1). By means of the fingers of the operator's hand the actuating loop (6) is then pressed towards the tube (4) causing the strip (5) to push the discharge cylinder (3) forwardly on the front cylinder (1). This forward movement of the discharge cylinder (3) on the front cylinder (1) pushes the elastic cord (2) off the front-cylinder (1) onto the base of the haemorrhoid to shut off its blood circulation. The restriction hole (10) is then opened to counterbalance the vacuum in the front cylinder (1), and the instrument is then removed from the patient.

10 In order to mount another elastic cord (2) on the inner front-cylinder (1) ready for further use, an adaptor (14) is attached to the front-cylinder (1). This adaptor (14) has a forward tapered portion (16), and a rearward tubular sleeve (18). The pointed front of the tapered portion (16) is sufficiently small to enter the elastic cord (2) when in its rest condition, and the outer surface of the rear of the tapered portion (16) is flush with or slightly larger than
15 the outer surface of the front-cylinder (1). The tubular sleeve (18) is dimensioned to make a push fit in the front-cylinder (1). The adaptor (14) is made of any suitable plastics material such as polyvinyl chloride or the thermoplastic material polypropylene.

Referring to Figure 6, a first hook device (20) of the invention is made of resilient wire and
20 includes two opposed arms (22) joined by a bowed connecting portion (24). Two hooks (26) are located at the ends of the arms (22). The hooks (26) are sufficiently small so that they can both enter the elastic cord (2) when in its rest condition, and these hooks (26) are blunt to avoid tearing the surgeon's gloves or other clothing or damaging the elastic cord.

25 In operation the arms (22) are pressed towards one another to enable the hooks (26) to be hooked through the elastic cord (2), and the arms are then released to enable the resilience of the connecting portion (24) to move apart the hooks (26) to expand the elastic cord sufficiently to mount this cord (2) on the forward tip of the adaptor (14). The hook device (20) is then moved rearwardly with respect to the instrument to pull the elastic cord (2)
30 along the adaptor (14) and on to the forward part of the front-cylinder (1). The hooks (26) are then removed from the stretched cord (2), and the adaptor (14) is removed from the

front-cylinder (1) leaving the instrument ready for use.

When the hook device (20) is in its rest position the arms are spaced apart as illustrated in Figure 6. The operator presses the arms (22) together to enable the hooks (26) to enter the elastic cord (2) in its rest condition, and the arms (22) are progressively released from this condition to enable the cord (2) to expand as it is drawn rearwardly over the adaptor (4) and on to the front-cylinder (1).

Referring to Figure 7, a second hook device (28) of the invention is made of an injection-moulded plastics material such as for example polypropylene. This hook device (28) includes two arms (30) joined by a connecting portion (32). Two hooks (34) are formed at the ends of the two arms (30).

A first crease or hinge line (36) extends longitudinally along the centre of the connecting portion (32), and a second crease or hinge line (38) extends laterally across the rear of the two arms (30).

The hook device (28) is folded or hinged along its first crease (36) thereby bringing together the two arms (30) and hooks (34) to enable the hooks (34) to be hooked into the elastic cord (2) when in its rest condition. The first crease (36) is then opened out causing the arms (30) and the hooks (34) to move apart thereby stretching the elastic cord (2). The hook device (28) is then folded or hinged along its second crease (38) to enable the adaptor (14) to pass over the recessed part (40) of the connecting portion (32) as the hook device (28) is moved rearwardly with respect to the surgical instrument to pull the elastic cord (2) over the adaptor (14) and onto the front-cylinder (1). The arms (30) of the hook device (28) move outwardly to expand the elastic cord (2) progressively as it is pulled over the adaptor (14) onto the front-cylinder (1). When the elastic cord (2) is placed on the front-cylinder (1) the hooks (34) are released from the elastic cord (2) leaving the instrument ready for use.

Preferably two diametrically opposed guide tracks extend longitudinally along the adaptor

(14) to guide the hooks (26; 34) of the hook devices (20;28) when mounting the elastic cord (2) on the front-cylinder (1).

CLAIMS

1. A mounting apparatus for mounting an elastic cord on the front-cylinder of a surgical instrument of the type defined; said apparatus including a tapered adaptor having a rear larger end for attachment to the forward end of the front-cylinder, and a forward smaller end for location in the elastic cord, characterised in that said apparatus includes a hook device (20,28) to propel the cord along the adaptor and onto the front-cylinder, the hook device comprises two opposed hooks (26,34) dimensioned to hook onto the cord when in its rest condition, and the device is adapted to bring the hooks towards and away from one another.
2. A mounting apparatus as claimed in claim 1, characterised in that the hooks (26,34) are located at the end of opposed arms (22,30).
3. A mounting apparatus as claimed in claim 1 or claim 2, characterised in that the arms (22) are made of a resilient material.
4. A mounting apparatus as claimed in claim 3, characterised in that the arms (22) are in the form of wire.
5. A mounting apparatus as claimed in claim 1 or claim 2, characterised in that the device (28) is made of a plastics material.
6. A mounting apparatus as claimed in claim 5, characterised in that the device (28) is made of polypropylene.
7. A mounting apparatus as claimed in claim 5 or claim 6, characterised in that the device includes a first crease (36) to enable the hooks (34) to be brought close together to enter the cord and to be moved apart to expand the cord.
8. A mounting apparatus as claimed in claim 7, characterised in that the device

includes a second crease (38) to enable the adaptor (14) to be moved into position adjacent the hooks (34).

9. A mounting apparatus as claimed in any preceding claim, characterised in that
5 guide tracks extend along the adaptor to guide the hooks when mounting the elastic cord.

10. A surgical instrument of the type defined including a mounting apparatus as claimed in any preceding claim.

10 11. A mounting apparatus substantially as herein described and illustrated in the accompanying drawings.

12. A surgical kit comprising mounting apparatus as claimed in any one of claims 1 to 9 and 11.

15 13. A surgical kit as claimed in claim 12 including an elastic cord specified in any one of claims 1 to 9.

20 14. A surgical kit as claimed in claim 12 or claim 13 including a surgical instrument of the type defined.

15. A hook device for use in a mounting apparatus as claimed in any one of claims 1 to 9 and 11.

25 16. Use of a hook device as specified in any one of claims 1 to 9 for mounting an elastic cord on the front cylinder of a surgical instrument of the type defined.

30 17. A method of mounting an elastic cord on the front cylinder of a surgical instrument of the type defined, said method comprising attaching a tapered adaptor to the forward end of the front cylinder, providing a hook device comprising two opposed hooks (26,34) to hook onto the elastic cord when in its rest condition, pulling the hook device

rearwardly with respect to the surgical instrument to pull the elastic cord over the tapered adaptor onto the front cylinder, and removing the hook device.

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ABSTRACTMedical Device

5 A mounting apparatus for mounting an elastic cord (2) onto the front-cylinder (1) of a surgical instrument for ligating internal tissues includes a tapered adaptor 14. This adaptor (14) makes a push fit in the front-cylinder (1) and includes a tapered forward portion (16) having a front end small enough to enter the elastic cord (2) when in its rest condition, and
10 a rear portion which is flush with or slightly larger than the outer surface of the front-cylinder (1).

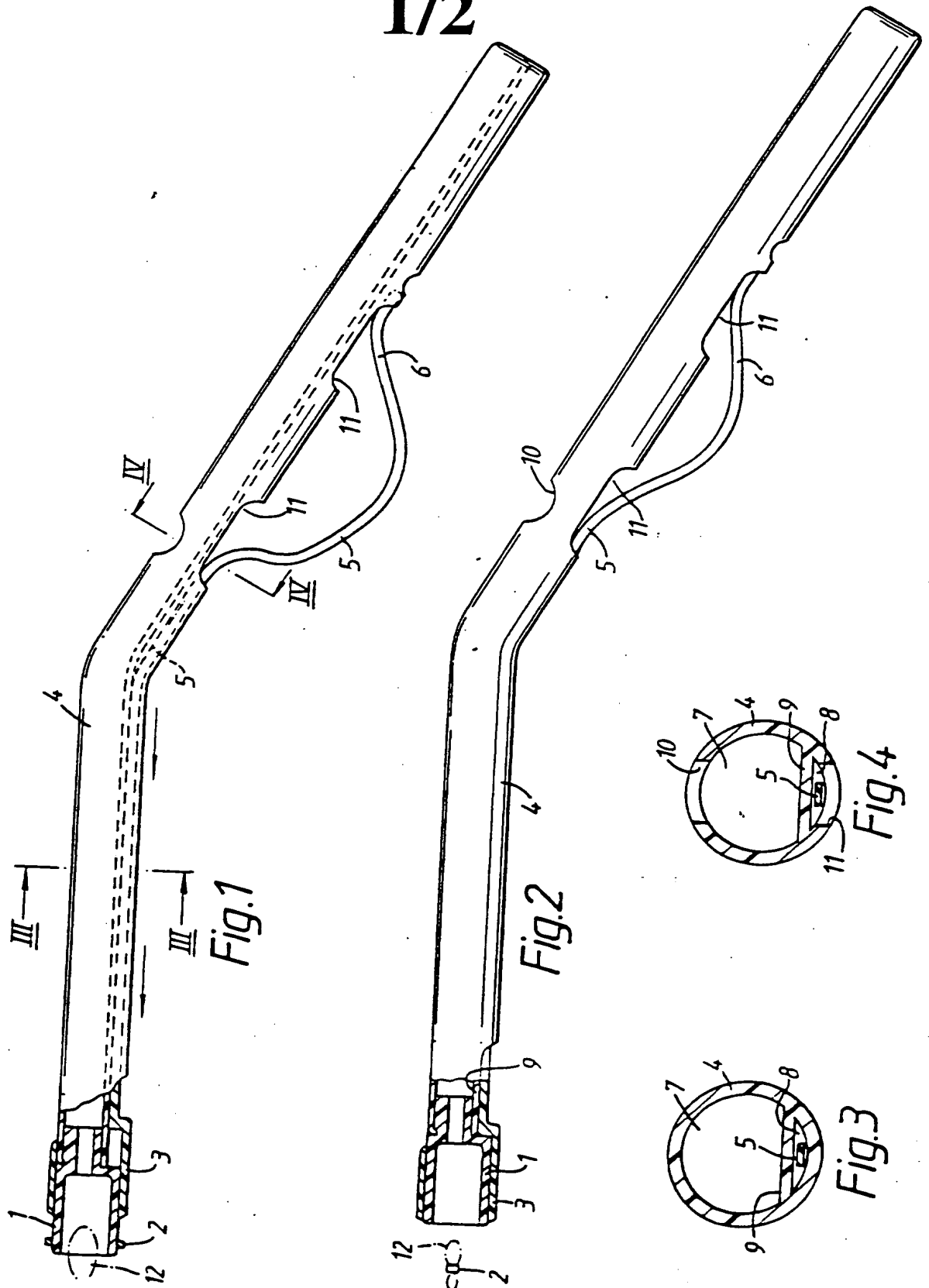
The apparatus includes a hook device (20) including two opposed arms (22) joined at one end by a connecting portion (24) and having blunt hooks (26) located at their other ends. The apparatus is made of a resilient material such as spring wire.

15

In operation, the arms (22) are pressed together to enable the hooks (26) to enter the elastic cord in its rest condition. The cord (2) is placed on the front end of the adaptor (14) and the hook device is moved rearwardly to pull the cord (2) over the adaptor (14) and onto the front-cylinder (1). As the cord (2) is pulled over the adaptor (14), the arms (22) are
20 progressively released to allow them to move apart thereby expanding the cord (2).

(Fig. 7)

1/2



2/2

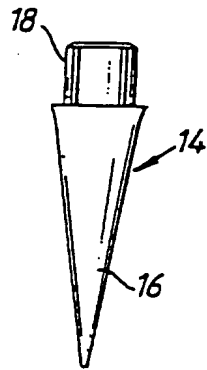


Fig. 5

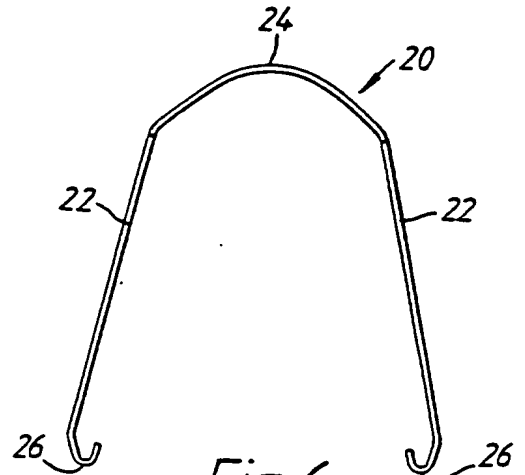


Fig. 6

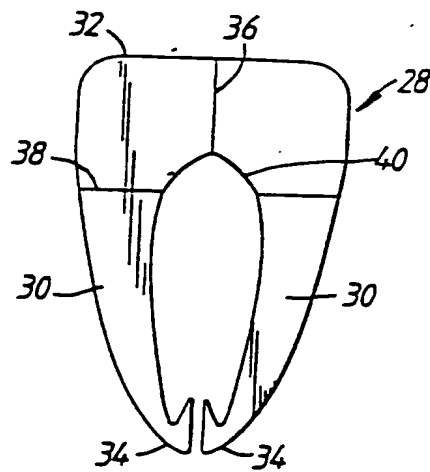


Fig. 7

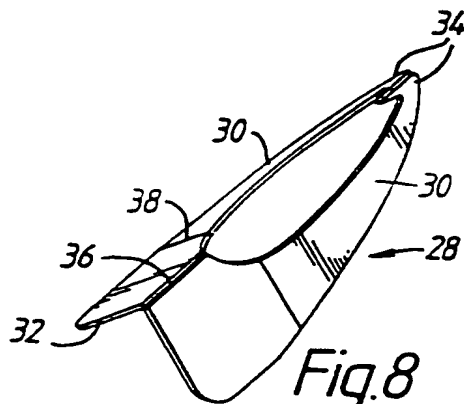


Fig. 8

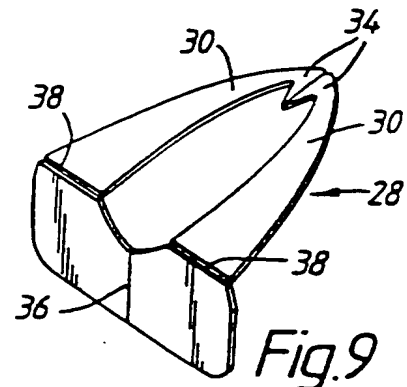


Fig. 9

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